WATER RESOURCES ACTIVITIES IN LOUISIANA DISTRICT FISCAL YEAR 1985

Compiled by R. A. Herbert and E. A. Ellsworth

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DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

DALLAS L. PECK, Director

For additional information
write to:

District Chief
U.S. Geological Survey
P.O. Box 66492
Baton Rouge, LA 70896
(Telephone: (504) 389-0281)

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INTRODUCTION

The mission of the U.S. Geological Survey, Water Resources Division, is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This is accomplished, in large part, through cooperation with other Federal, State, and local agencies by:

- Collecting data on a systematic basis, needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.
- Conducting analytical and interpretive water-resources appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water.
- Conducting supportive basic and problem oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently well to quantitatively predict their response to stress, either natural or manmade.
- Disseminating the water data and the results of these investigations and research through reports, maps, computerized information services, and other forms of public releases.
- Coordinating the activities of Federal agencies in the acquisition of water for streams, lakes, reservoirs, estuaries, and ground waters.
- Providing scientific and technical assistance in hydrologic fields to other Federal, State and local agencies, to licensees of the Federal Power Commission, and to international agencies on behalf of the Department of State.

Water-resources activities of the U.S. Geological Survey in Louisiana consist of collecting water-resources data and conducting interpretive hydrologic investigations and research. The water-resources data and the results of the interpretive investigations are published or released by either the U.S. Geological Survey or by cooperating agencies. This report describes the water-resources activities in Louisiana for the 1985 fiscal year (October 1, 1984 to September 30, 1985).

DISTRICT OFFICE ORGANIZATION

The Louisiana District of the Water Resources Division, U.S. Geological Survey conducts water-resources investigations and data collection under the leadership of Darwin Knochenmus, District Chief. The District consists of a Hydrologic Surveillance Section, a Hydrologic Investigations Section, a Reports Section, the Alexandria Subdistrict office, and two field offices, in addition to the necessary administrative and other support functions.

Requests for information should be addressed to:

Darwin Knochenmus, District Chief
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0281

John J. Musser, Associate District Chief
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0281

Elaine A. Gockel, Administrative Officer, U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0281

Darrell D. Carlson, Chief
Surveillance Section
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0234

John R. Harsh, Chief
Investigations Section
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0391

Geraldine R. Stallworth, Chief
Reports Section
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0442

Kenneth J. Covay, Acting Chief
Subdistrict Office
U.S. Geological Survey
Water Resources Division
P.O. Box 5402
Alexandria, Louisiana 71301
Phone: (318) 497-7988

Anthony H. Devillier
Hydrologic Tech-in-Charge
Field Office
U.S. Geological Survey
Water Resources Division
P.O. Box 66492
Baton Rouge, Louisiana 70896
Phone: (504) 389-0234

Robert O. Walsworth
Hydrologic Tech-in-Charge
Field Office
U.S. Geological Survey
Water Resources Division
P.O. Box 1629
Ruston, Louisiana 71270
Phone: (318) 351-9630

In addition, the following District Discipline Specialists can be contacted for information:

Duane E. Everett
Water Quality Discipline Specialist
Phone: (504) 389-0529

Max J. Forbes, Jr.
Surface Water Discipline Specialist
Phone: (504) 389-0281

Dale J. Nyman
Acting Ground Water Discipline Specialist
Phone: (504) 389-0391

Geraldine R. Stallworth
Report Specialist
Phone: (504) 389-0442

Daniel J. Gockel
Computer Specialist
Phone: (504) 389-0281

COOPERATING AGENCIES

Hydrologic activities are conducted in large part through cooperation with State, local, and other Federal agencies who share in the planning and financial support of the program. The cooperators are:

State and Local Agencies

Capital Area Groundwater Conservation Commission

East Baton Rouge Parish

Jefferson Parish

Louisiana Department of Environmental Quality
-Office of Water Resources

Louisiana Department of Natural Resources
-Office of Conservation

Louisiana Geological Survey

Louisiana Department of Transportation and Development
-Office of Public Works
-Office of Highways

Sabine River Compact Administration

Other Federal Agencies

Federal Emergency Management Agency

National Park Service

U.S. Army, Fort Polk, Louisiana

U.S. Army, Corps of Engineers, New Orleans, Louisiana District

U.S. Army, Corps of Engineers, Vicksburg, Mississippi District

U.S. Environmental Protection Agency

WATER-RESOURCES ACTIVITIES

The U.S. Geological Survey, Water Resources Division conducts three major types of activities in Louisiana, in order to provide the hydrologic information and understanding needed for the best management of Louisiana's and the Nation's water resources. The activities are:

1. Data collection and dissemination
2. Water-resources appraisals (interpretive studies)
3. Research.

These activities are described in the remainder of this section.

PROJECT TITLE: Surface-water stations

PROJECT NUMBER: LA00-001

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCIES: Department of Transportation and Development, Office of Public Works and Office of Highways; Department of Environmental Quality; U.S. Army Corps of Engineers; City-Parish of Baton Rouge; and Jefferson Parish, Louisiana

PROJECT CHIEF: Darrell Carlson, District Office, Baton Rouge

PROJECT DURATION: Continuous

PROBLEM: Surface-water information is needed for surveillance, planning, design, hazard warning, operation, and management, in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development. To provide this information, an appropriate data base is necessary.

OBJECTIVE: A. To collect surface-water data sufficient to satisfy needs for current uses, such as (1) assessment of water resources, (2) operation of reservoirs or industries, (3) forecasting, (4) disposal of wastes and pollution controls, (5) discharge data to accompany water-quality measurements, (6) river compact and legal requirements, and (7) research or special studies. B. To collect data necessary for analytical studies to define for any location the statistical properties of, and trends in, the occurrance of water in streams, lakes, estuaries, and other water bodies, for use in planning and design.

APPROACH: Standard methods of data collection are described in the series, "Techniques of water-resources investigations of the United States Geological Survey." Partial-record gaging stations are used instead of complete-record gaging stations where appropriate.

PROGRESS: Hydrologic data for continuous-record, reservoir, and partial-record surface-water stations in Louisiana are collected and published under the general supervision of the District Office. Some minor changes have been made to the network in agreement with the cooperators. The annual data report for 1983 was published. Began using a one-dimensional model for determining daily discharges at slope-affected stations. A number of sites were established in the coastal areas using electromagnetic flowmeters. The surface-water monitoring network is shown in figure 1.

PLANS FOR FY-85: Continue operation of the surface-water data network. Consult cooperators relevant to any changes in the data network. Answer requests for information on streamflow in Louisiana. Increase effort in using one-dimensional flow model for computing daily discharges at slope-affected stations. Five new sites will be installed with Handar satellite-data collection platforms.

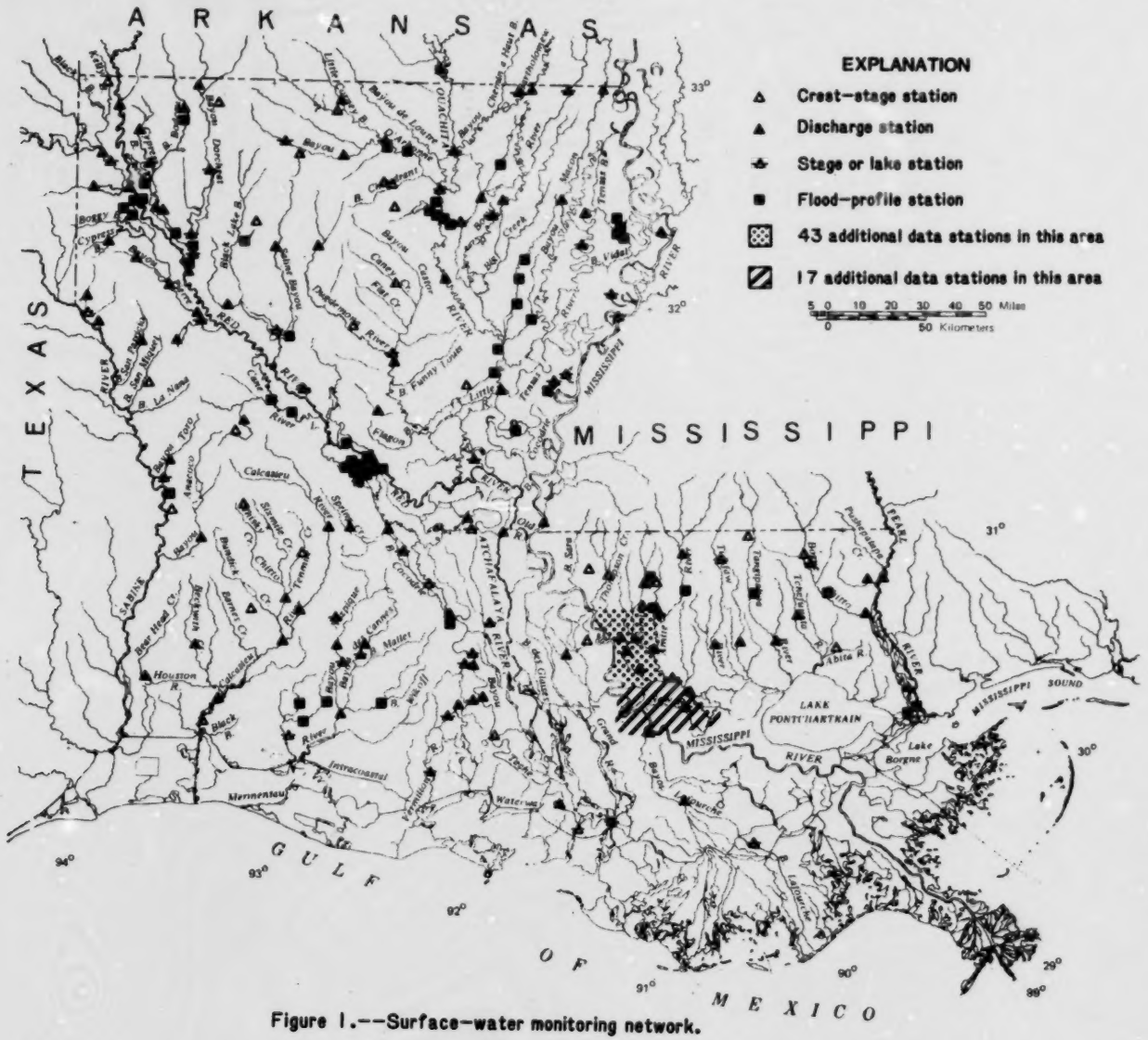

Figure 1.--Surface-water monitoring network.

PROJECT TITLE: Ground-water stations

PROJECT NUMBER: LA00-002

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCIES: Department of Transportation and Development, Office of Public Works and Office of Highways; U.S. Army Corps of Engineers; and Capital Area Groundwater Conservation Commission

PROJECT CHIEF: Darrell D. Carlson, District Office, Baton Rouge

PROJECT DURATION: Continuous

PROBLEM: Long term water-level records and other ground-water data are needed to evaluate the effects of climatic variations on the recharge to and the discharge from the ground-water systems, to provide a data base from which to measure the effects of development, to assist in the prediction of future supplies, and to provide data for management of the resource.

OBJECTIVE: A. To collect water-level data sufficient to provide a minimum long-term data base so that the general response of the hydrologic system to natural climatic variations and induced stresses is known, and potential problems can be defined early enough to allow proper planning and management. B. To provide a data base against which the short-term records acquired in areal studies can be analyzed. This analysis must (1) provide an assessment of the ground-water resources, (2) allow prediction of future conditions, (3) detect and define pollution and supply problems, and (4) provide the data base necessary for management of the resource.

APPROACH: Establish and maintain data networks to meet objectives. Networks are reviewed at regular intervals and quality control of collected data is achieved on a regular basis. Networks provide broad coverage of hydrologic conditions in the geologic provinces of the State and data for all major aquifers, including anticipation of projects in District's long-range plan. Special emphasis is given to problem areas such as serious water-level declines and saltwater encroachment.

PROGRESS: Water-level and water-quality data for observation wells were compiled and published for 1983 in the annual data report. Additional progress was made in putting the water-level and water-quality data into GWSI (ground-water site inventory) file. Supported areal and special projects by furnishing data in a variety of computer formats. Continued support of the test-well program. Completed review of ground-water network in southeast Louisiana. The results of this effort will be implemented in 1985 water year effort. The ground-water monitoring network for water levels is shown in figure 2.

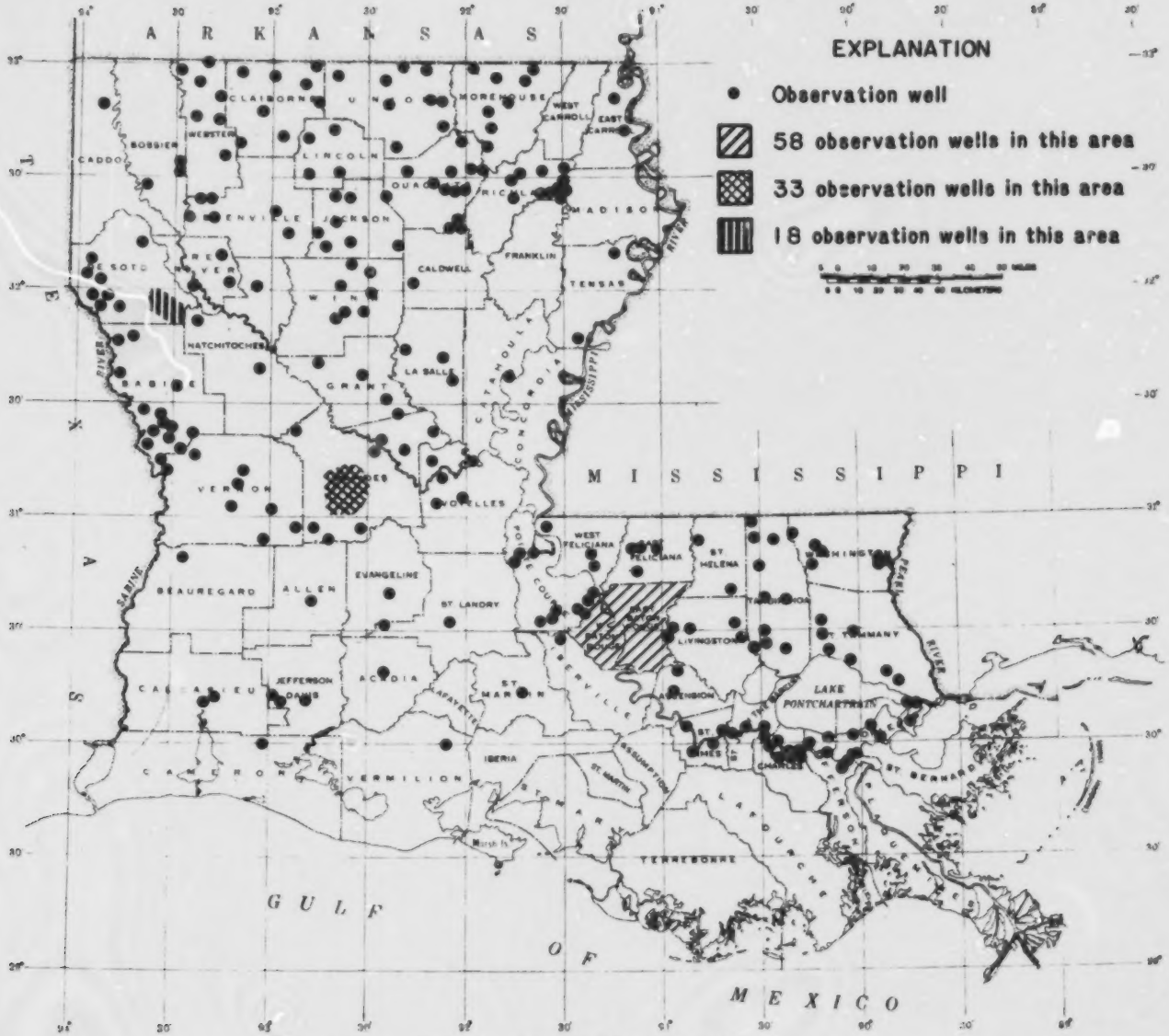

Figure 2.-- Ground-water monitoring network.

PLANS FOR FY-85: Continue to review the observation-well network in the State; the next area planned for a thorough water-level and water-quality network review is the five-parish area around the City of Baton Rouge. Continue to maintain GWSI file by inputting water-level records and water-quality records. Answer information requests for water-level and water-quality data.

PROJECT TITLE: Quality-of-water stations

PROJECT NUMBER: LA00-003

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCIES: Department of Transportation and Development, Office of Public Works; Department of Natural Resources; Sabine River Compact Administration; U.S. Army Corps of Engineers; NASQAN (National Stream Quality Accounting Network); Benchmark Program; and National Park Service

PROJECT CHIEF: Duane E. Everett, District Office, Baton Rouge

PROJECT DURATION: Continuous

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of the water resource, the chemical, physical, and biological quality of the rivers, streams, and lakes must be defined and monitored.

OBJECTIVE: To provide a statewide bank of water-quality data for broad planning and action programs and to provide data for management of the State's waters, as well as interstate and international waters.

APPROACH: Operation of a network of water-quality stations and observation wells to provide average chemical concentrations, loads, and time trends as required by planning and management agencies.

PROGRESS: Water-quality data for rivers, streams, and lakes were compiled and published for 1983 in the annual data report. Data collection scheduled for 1984 was completed. The water-quality network was evaluated and adjusted as needed. The water-quality monitoring network is shown in figure 3.

PLANS FOR FY-85: Continue operation of network. Review station requirements and adjust network as necessary. Implement new daily stations on two streams near Arkansas.

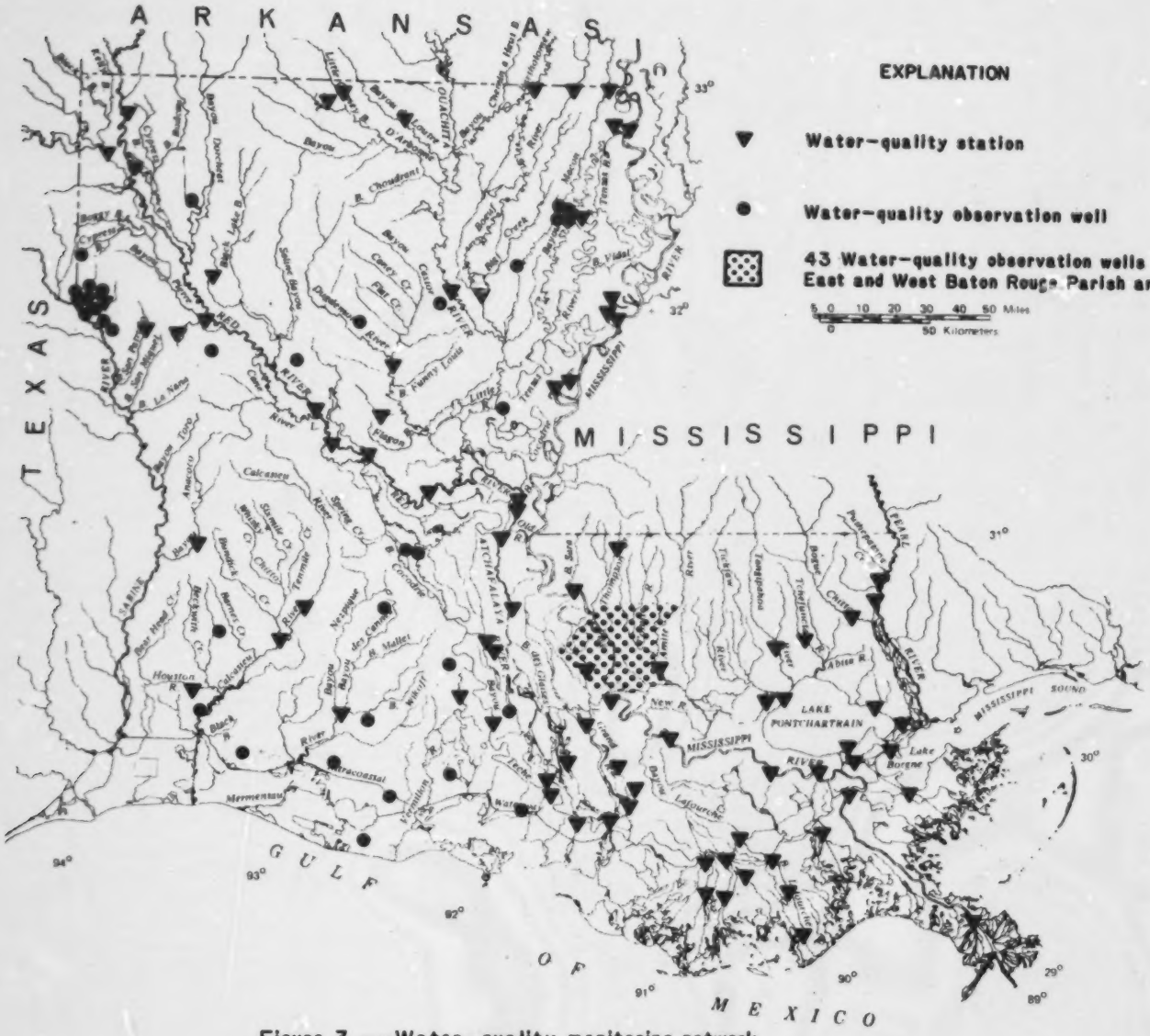

Figure 3.--Water-quality monitoring network.

PROJECT TITLE: Sediment stations

PROJECT NUMBER: LA00-004

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCIES: Department of Transportation and Development, Office of Public Works; Department of Natural Resources; U.S. Army Corps of Engineers; CBR Program (Collection Basic Records); NASQAN (National Stream Quality Accounting Network; and Benchmark Program

PROJECT CHIEF: Duane E. Everett, District Office, Baton Rouge

PROJECT DURATION: Continuous

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. Sediment concentrations and discharges in rivers and streams must be defined and monitored.

OBJECTIVE: To provide a statewide bank of sediment data for use in broad Federal and State planning and other programs and to provide data for management of the State's waters, as well as interstate and international waters.

APPROACH: Establish and operate a network of sediment stations to provide spatial and temporal averages and trends of sediment concentration, sediment discharge, and particle size of sediment being transported by rivers and streams.

PROGRESS: Sediment data were compiled and published for 1983 in the annual data report. Data Collection scheduled for 1984 was completed. Concentration and particle-size analyses were determined for samples collected from 10 locations by the Corps of Engineers. Sediment samples were collected from 25 locations by the USGS.

PLANS FOR FY-85: Continue operation of network. Review station requirements and adjust the network as necessary.

PROJECT TITLE: Flood investigations

PROJECT NUMBER: LA75-006

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCY: Federal Emergency Management Agency (FEMA)

PROJECT CHIEF: Fred N. Lee, District Office, Baton Rouge

PROJECT DURATION: Continuous

PROBLEM: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provide for the operation of a flood insurance program. The FEMA (Federal Emergency Management Agency) needs flood studies in selected areas to determine applicable flood insurance premium rates.

OBJECTIVE: To conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and to present the results in an appropriate format.

APPROACH: To conduct the necessary evaluations or to conduct surveys by ground or photogrammetric methods. Determine flood-discharge frequency relationships using local historical information, gaging station records, or other applicable information. Determine water-surface profiles using step-backwater models or by other acceptable methods and furnish the results in reports prepared to FEMA specifications.

PROGRESS: Conducted studies of potential floodprone areas requested by FEMA.

PLANS FOR FY-85: Conduct less-detailed studies of potential flooding for areas of Louisiana, as requested by FEMA.

PROJECT TITLE: Water-use data system

PROJECT NUMBER: LA83-007

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Dee L. Lurry, District Office, Baton Rouge

PROJECT DURATION: Continuous since April 1979

PROBLEM: Data on water-use are essential to appraise the reliability of present water supplies and to plan for future water needs.

OBJECTIVE: Collect, collate, verify, and store water-use data to provide water users and planners accurate information on quantities pumped or diverted by source, standard use categories, and geographic units.

APPROACH: To collect user data, process, and store in the SWUDS (State Water-Use Data System) and National Water-Use Data System. Develop plans for updating files and improving quality of data. Publish periodic reports of information obtained, and develop computer-graphic programs to supply all types of data needs.

PROGRESS: Compiled public supplies water-use data to be published in two volumes, including all water systems in Louisiana that serve 250 people or more. State Water-Use Data System was made operational on the local computer system and used to store Capital Area Groundwater Conservation Commission pumpage data for 1975-84.

PLANS FOR FY-85: Begin collection and compilation of water-use data to be published for 1985 using SWUDS. Organize a water-use coordinating committee.

PROJECT TITLE: Low-flow investigations of streams in Louisiana

PROJECT NUMBER: LA81-068

STUDY LOCATION: Louisiana, Mississippi River delta and coastal region south of Interstate 10 and west of Atachafalaya River

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Fred N. Lee, District Office, Baton Rouge

PROJECT DURATION: March 1981 through September 1985

PROBLEM: Very little information is available for the low-flow regime of streams in the Mississippi River delta and in the coastal areas of Louisiana. These areas were not included in previous low-flow studies because drainage areas could not be accurately defined. These studies are significant in computing flows for ungaged sites using equations and graphs. In addition, state-discharge relationships can not be developed for those streams affected by tidal fluctuations.

OBJECTIVE: To improve methods of obtaining flows at streamflow sites in the delta and the coastal areas of the State.

APPROACH: Determine flow at selected points in ungaged areas by means of the magnetic flow meter and correlate data for selected sites with continuous-record stations. Identify and measure significant basin and stream characteristics and evaluate their utility in correlation with low flows.

PROGRESS: A report was written and published describing results of the study as pertains to the upland part of the State. Site specific discharge measurements were made for many miscellaneous sites throughout the Mississippi River delta and the coastal region. Continuous-discharge data are being collected at five-flow meter sites and these data are being analyzed to be included in a final report for the project.

PLANS FOR FY-85: Complete project and publish final report.

PROJECT TITLE: Hydrology and quality of ground-water resources, Livingston and St. Helena Parishes, Louisiana

PROJECT NUMBER: LA82-070

STUDY LOCATION: Livingston and St. Helena Parishes, in the central part of southeastern Louisiana

COOPERATING AGENCY: Department of Transportation and Development

PROJECT CHIEF: Dan J. Tomaszewski, District Office, Baton Rouge

PROJECT DURATION: April 1982 through September 1985

PROBLEM: Livingston and St. Helena Parishes comprise the only area in southeastern Louisiana not covered by areal reports appraising the ground-water resources. The area is adjacent to the rapidly growing Baton Rouge metropolitan area and is strongly affected by pumping at Baton Rouge. The area is undergoing rapid development, but growth is hindered by water-quality problems, including high iron concentrations and corrosiveness. Surface and subsurface-waste disposal are a source of concern and potential problems in the area.

OBJECTIVE: The primary objective is to define the ground-water hydrology of Livingston and St. Helena Parishes, with emphasis on the quantity and quality of water available from shallow aquifers. A secondary objective is to evaluate the potential for ground-water contamination resulting from surface and subsurface-waste disposal.

APPROACH: Scheduled water wells and petroleum-test wells will provide most of the hydrologic data needed. A reconnaissance study will include additional wells in areas of sparse data. Test wells may be drilled in key areas if no existing wells can be located. File data will be supplemented by new analyses to determine water-quality background levels of common and trace inorganic elements, radioelements, total organic carbon, and selected pesticides. Vulnerability of shallow aquifers to contamination by surface disposal of wastes will be evaluated by determining the thickness and continuity of overlying clays.

PROGRESS: Collection of ground-water quality data and water-level data has been completed. Potentiometric maps have been constructed from water-level data and geohydrologic sections have been updated with data collected during test drilling.

PLANS FOR FY-85: Analysis and compilation of ground-water data will be completed. An interpretive report designed to provide water-supply and environmental information will be produced.

PROJECT TITLE: Mississippi embayment-gulf coast regional aquifer-system analysis

PROJECT NUMBER: LA83-071

STUDY LOCATION: Louisiana, southern Mississippi, and southwestern Alabama

COOPERATING AGENCY: Federal Thrust Program, Regional Aquifer System Analysis (RASA)

PROJECT CHIEF: Angel Martin, Jr., District Office, Baton Rouge

PROJECT DURATION: April 1982 through March 1987

PROBLEM: Ground-water withdrawals from the Mississippi Embayment aquifers in southern Louisiana, southern Mississippi, and southwestern Alabama have progressed such that the ground-water supply has been depleted by an estimated one third. Withdrawals from these aquifers are expected to increase as energy-related industries, irrigation, and urban development continue to grow in the project area. In order to evaluate the regional effects of increased ground-water withdrawals, a study quantifying the freshwater flow system is required.

OBJECTIVE: Analyze and interpret hydrologic information in the project area, in order to accurately describe the flow and water chemistry of the ground-water system, and to estimate the effects of future stresses on the system.

APPROACH: Assemble and analyze hydrologic data from various sources. These data, and the results from studies conducted in the project area during the course of this study will be used to (1) obtain an understanding of the regional flow system, (2) produce maps showing the geometry of the aquifers and confining beds, (3) produce maps showing the hydrologic characteristics of the aquifers and confining beds, and (4) design and calibrate a quasi-three-dimensional ground-water flow model to quantify the flow system and estimate the effect of stresses on the system.

PROGRESS: Most of the data has been assembled and analyzed. Hydrologic maps have been prepared, and three map reports describing the stratigraphy and hydrology of part of the aquifer system in the project area have been approved for publication. Data are being prepared for input to the USGS quasi-three-dimensional ground-water flow model. A preliminary model was completed to evaluate model input parameters. The first draft of a water-resources investigations report describing the hydrology of the study area and the modeling effort is nearly complete.

PLANS FOR FY-85: Calibrate the flow model to 1980 steady-state conditions and investigate the need for transient calibrations. Perform pumping experiments on the calibrated steady-state model. Complete the first draft of the report and rewrite after detailed review. Prepare a report base map and rough drafts of report figures.

PROJECT TITLE: Transfer of water-resources information

PROJECT NUMBER: LA83-075

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Harry McWreath, District Office, Baton Rouge

PROJECT DURATION: October 1983 through September 1985

PROBLEM: The U.S. Geological Survey's primary mission with regard to water resources is to collect hydrologic and geohydrologic information and to appraise the Nation's water resources. The Water Resources Division in the USGS carries out this mission by publishing basic data reports and by investigating specific water-resource problems or issues in cooperation with Federal, State and local authorities. The results of these studies are often published in technical and scientific reports. But the general public, also, has a need for and an interest in hydrologic information.

OBJECTIVE: To fulfill the need for generalized or summarized hydrologic and geohydrologic information for the general public in Louisiana.

APPROACH: One component of the project, a monthly newsletter titled "Water Situation in Louisiana," provides the latest information on surface-water, ground-water, and quality of water conditions throughout Louisiana. Basic data are presented in graphic and tabular form. In addition, annual narrative summaries of hydrologic conditions and significant hydrologic events, such as floods, are featured in several issues. Free subscription to the Newsletter can be obtained by notifying the U.S. Geological Survey, P.O. Box 66492, Baton Rouge, Louisiana 70896.

Another component of the project consists of a series of map sheets depicting generalized hydrologic and geohydrologic information on a State map with supporting text, graphics, and references. Each map sheet will be issued separately and will cover a particular hydrologic topic. Eventually, the entire series of published map sheets may be collected and re-issued as a bound "Hydrologic Atlas of Louisiana."

PROGRESS: The newsletter is prepared each month as scheduled. The first two map sheets, "Mean Annual Runoff in Louisiana" and "Occurrence of Major Freshwater Aquifers in Louisiana" have received colleague review and are being submitted for Director's approval. A third map sheet, "Base of Freshwater in Louisiana," has been completed and is ready for colleague review.

PLANS FOR FY-85: Obtain Director's approval and publish the first two map-sheets, and possibly the third. Develop and begin review of two or three new map sheets, topics to be selected.

PROJECT TITLE: Radioactive elements in ground water in Louisiana

PROJECT NUMBER: LA83-076

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: J. L. Snider, Subdistrict Office, Alexandria

PROJECT DURATION: October 1982 through September 1985

PROBLEM: High concentrations of radioactivitiy in a Miocene aquifer water well have caused concern in central Louisiana. Background data on distribution of radioactivity in fresh ground water in Louisiana are virtually nonexistant.

OBJECTIVE: (1) To obtain data on radioactivity of fresh ground water in Louisiana with emphasis on aquifers in Miocene and Pliocene age in central Louisiana. (2) To identify aquifers and areas where natural levels of radioactivity are high. (3) To determine uranium concentrations of water in aquifers of Miocene and Pliocene age in central Louisiana.

APPROACH: Sampling in 1983 provided statewide coverage of aquifers. Sampling in 1984 emphasized aquifers of Miocene and Pliocene age in central Louisiana.

PROGRESS: Sampling is completed and analysis of data has started.

PLANS FOR FY-85: Complete data analysis and finish report.

PROJECT TITLE: Suspended-sediment and minor-element transport in the lower Mississippi River, (Research merit project)

PROJECT NUMBER: LA83-077

STUDY LOCATION: Lower Mississippi River from Tarbert Landing, Mississippi, to Venice, Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Charles R. Demas, District Office, Baton Rouge

PROJECT DURATION: October 1982 through September 1986

PROBLEM: Sediment deposition and bed movement in the lower Mississippi River are constant threats to navigation. Additionally, levees and other flood-control structures on the lower Mississippi River have distorted natural sediment deposition in the coastal wetlands, contributing to an accelerated coastal erosion and land loss. The sediment and water-quality characteristics of the river system need to be determined to provide information for planning and design of navigation projects and diversions for wetlands management.

OBJECTIVE: (1) To identify areas where suspended sediment and its associated chemical load are deposited or resuspended. (2) To determine selected chemical-constituent loads in relation to suspended-sediment concentrations, particle size, water discharge, and bottom sediments. (3) Attempt to develop a sediment transport model for the lower Mississippi River to simulate both sediment and chemical loads.

APPROACH: Suspended sediment, bottom material, and attached chemical constituents samples will be collected monthly and during several rises of the river at selected sites. Suspended sediment and bottom material will be analyzed for particle-size distribution. Trace metals and organics will be determined on bulk samples and on separated grain-size fractions. Correlations between grain size and chemical concentrations will be made to aid in determining chemical-transport rates. An attempt will be made to model the riverine system and use the model to simulate sediment movement and associated chemical transport.

PROGRESS: Two years of chemical, suspended-sediment, and discharge data have been collected. Five major thalweg suspended-sediment sampling trips have been completed at discharges of 220,000; 280,000; 535,000; 620,000; and 1,000,000 ft^3/s. Chemical and sediment data have been entered into the District computer and analyzed, using multiple regression and factor analyses. Strong correlations were observed among percent finer than 63 micrometers suspended sediment and total and suspended iron, total and suspended manganese, and total and suspended chromium concentrations. Actual chemical analysis of different suspended-sediment particle-size groups confirmed the correlations. Work has begun on the sediment-transport model and a simulation of a conservative tracer has been made.

PLANS FOR FY-85: Completed field activities in February 1985, including all sediment and particle-size chemistry. Complete calibration of the sediment model and finish all planned reports.

PROJECT TITLE: Development of methods for determining water use in rice irrigation

PROJECT NUMBER: LA83-078

STUDY LOCATION: Southwestern Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Kenneth J. Covay, Subdistrict Office, Alexandria

PROJECT DURATION: October 1982 through September 1987

PROBLEM: There is a need for more precise methods of estimating water use information on irrigation within the Water Use Program of the USGS.

OBJECTIVE: (1) Determine accuracy of remote sensing techniques in estimating acreages and differentiating surface water from ground water. (2) Develop methods for determining water budgets and estimating water-use categories for individual fields. (3) Develop methods using remote sensing and individual-field water-use results to obtain surface water use information for canal systems and river basins. (4) Develop methods using remote sensing and individual-field water-use results to obtain ground water-use information by parish and hydrologic unit.

APPROACH: The field work for this project will be conducted in the rice fields of southwestern Louisiana. Water budget analyses will be done on monitored fields. Remote sensing information will provide total acreages on which either surface water or ground water are applied each season. Hydrologic budgets for canal-companies and river basins will be determined which will help in establishing methods for estimating water use by hydrologic unit and parish.

PROGRESS: Project funding was drastically reduced, resulting in less broad-based data collection, but compensated in part by a more intensive study of fewer fields. A USGS research advisor assisted in designing a more precise approach to evaluate the water budget in rice fields. Meteorological equipment consisting of a wind gage, relative humidity and temperature gage, recording rain gage, three radiation gages, and a data logger were purchased. Seven microlysimeters were fabricated and installed. This eqipment is used to measure evaporation and evapotranspiration. Surface-water inflow and outflow data were collected by conventional methods. Ground-water pumpage records, instantaneous precipitation, and pan-evaporation data were also collected. The canal chosen for efficiency rating was not used during FY-84.

PLANS FOR FY-85: Evaluate meteorological equipment for this study. The equipment will be calibrated and installed in one rice field. Data collected will be entered into the computer for processing. The new equipment will be used to obtain precise evapotranspiration data. Determine whether the microlysimeters installed at another rice field in the project area can be used in transfer of data. Previously collected data will be evaluated for reliability and use. Revise report outline and begin writing report.

PROJECT TITLE: Application of digital modeling for evaluating ground-water resources of the "400- and 600-foot" sands of the Baton Rouge area, Louisiana

PROJECT NUMBER: LA83-080

STUDY LOCATION: East and West Baton Rouge, East and West Feliciana, and Pointe Coupee Parishes

COOPERATING AGENCIES: Department of Transportation and Development, Office of Public Works; and Capital Area Groundwater Conservation Commission

PROJECT CHIEF: Eve Kuniansky, District Office, Baton Rouge

PROJECT DURATION: August 1983 through September 1985

PROBLEM: The "400- and 600-foot" sands are heavily pumped aquifers in the Baton Rouge area. Recurring demands for ground water in the area may result in increased withdrawals from these aquifers. A methodology needs to be developed for evaluating the effects of increased pumpage on water levels within the "400- and 600-foot" sands. Increased withdrawal may result in the "400- and 600-foot" sands being recharged by water of less acceptable quality, such as the Mississippi River or nearby shallow ground water contaminated by hazardous wastes.

OBJECTIVE: (1) Show the impact of pumping from aquifers in the Baton Rouge area on the potentiometric surfaces of the "400- and 600-foot" sands. (2) Determine the extent of vertical movement of water above the "400- and 600-foot" sands into these aquifers. (3) Determine the amount of water movement between the "400- and 600-foot" sands and the Mississippi River alluvium.

APPROACH: Principal approach is to prepare a three-dimensional model of the "400- and 600-foot" sands system of aquifers. Development of the model would include (1) data preparation, (2) grid preparation and preliminary model runs, and (3) model calibration. Model simulations will be used to determine the impacts of alternative pumping plans and to define the ground-water processes that affect the interchange of water between the "400- and 600-foot" sands and the Mississippi River, and to determine the potential for movement of water into the system from overlying layers.

PROGRESS: One-dimensional modeling of Baton Rouge fault was completed. A mapping report is almost ready for review. A model grid was chosen and some input data have been prepared.

PLANS FOR FY-85: Approval of mapping report for publication. Complete the three-dimensional modeling and prepare first draft of modeling report.

PROJECT TITLE: Hydrologic characteristics of the Chicot aquifer in southwestern Louisiana

PROJECT NUMBER: LA84-083

STUDY LOCATION: Southwestern Louisiana and southeastern Texas

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Dale J. Nyman, District Office, Baton Rouge

PROJECT DURATION: October 1983 through September 1986

PROBLEM: The Chicot aquifer is the primary source of freshwater for a 13-parish area. Irrigation and industrial withdrawals, averaging nearly one-billion gallons per day, are causing local saltwater intrusion problems. If withdrawals were steadily increased saltwater intrusion could destroy much of the freshwater storage in this coastal aquifer system.

OBJECTIVE: To develop an understanding of the Chicot aquifer system and the effects of pumping stresses upon that system.

APPROACH: Construct a three-dimensional finite-difference model that will adequately simulate the Chicot aquifer system and a portion of the underlying Evangeline aquifer. Aquifer data will be refined and estimated for each grid space of the model. Pumpage and water-level data have been available since the middle 1940's and are sufficient to adequately verify the model. Land satellite (Landsat) imagery from 1978 will be used to more accurately distribute irrigation pumpage over the modeled area.

PROGRESS: The geologic and hydrologic data needed for the coarse-grid model have been compiled and both steady-state and transient models are running well. Pumpage data for the first 7 of 12 stress periods have been input to the transient model and generally acceptable results have been obtained. A report summarizing water levels, pumpage, and aquifer characteristics for southwestern Louisiana has been completed and is in District review.

PLANS FOR FY-85: Finish calibrating a coarse-grid model of the Chicot aquifer system. Use remote sensing data to determine areal distribution of irrigation pumpage for the calibration. Measure water levels and prepare maps of water levels in the Chicot aquifer for 1985. Develop and begin calibrating a detailed model of the Chicot aquifer system.

PROJECT TITLE: Containment of organic waste in low permeability clays of the gulf coastal plain in southwestern Louisiana, (Research merit project)

PROJECT NUMBER: LA83-084

STUDY LOCATION: Browning-Ferris Industries, Willow Springs Hazardous Waste Facility, Willow Springs, Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Douglas A. Trudeau, District Office, Baton Rouge

PROJECT DURATION: October 1983 through September 1986

PROBLEM: An understanding of the impact of past hazardous waste disposal methods is urgently needed to evaluate the potential hydrologic hazards of future disposal activities. The hydrologic and geologic characteristics of the clay environment that determine the movement of ground water and organic contaminants need to be understood. Interactions of organic contaminants and clays need to be more clearly defined so that changes in the chemical characteristics of contaminants can be anticipated as they move through the system. Also, the hydraulic characteristics of the clays need to be studied to determine any changes that might occur as a result of exposure to organic contaminants

OBJECTIVE: To define the clay mineralogy and the hydraulic processes related to the presence and movement of organic solutes in geologic materials having low hydraulic conductivities.

APPROACH: The study will be oriented toward documentation of the current conditions at a site located in Calcasieu Parish in southwestern Louisiana. Clay particle size, mineral type, and ion exchange capacity will be determined. Drillers' logs and surface geophysical methods will be used to determine clay depth, location, and thickness. Pumping tests and slug tests will be used to determine hydraulic conductivity of the system in the clays and underlying sands in contaminated and uncontaminated areas. Water levels in the established observation wells located in and surrounding the site will be used to define flow patterns. The physical and chemical properties of interstitial water in natural and contaminated areas will be documented from sample analysis. A ground-water flow model will be evaluated for its utility in describing processes related to ground-water movement through clays.

PROGRESS: Wells around the site have been scheduled. A paper on sampling-purging methods effects on sampling ground waters for volatile organics has been prepared. Wells have been drilled around the site.

PLANS FOR FY-85: Finish drilling wells at the site. Begin measuring water levels and sample selected wells. Complete majority of sediment characterization. Begin developing a ground-water model of the site.

PROJECT TITLE: The quality of ground water and nature of contamination of shallow aquifers in the gulf coastal plain of Louisiana and Mississippi

PROJECT NUMBER: LA84-086

STUDY LOCATION: Louisiana--from the northern part of East Baton Rouge Parish about 25 miles north into East Feliciana Parish; and
Mississippi--from the gulf coast to about 20 miles north of Gulfport

COOPERATING AGENCY: Federal Thrust Program, Hazardous Waste Hydrology

PROJECT CHIEF: Duane E. Everett, District Office, Baton Rouge

PROJECT DURATION: July 1984 through September 1985

PROBLEM: To assess the quality of shallow ground water in the gulf coastal plain and to correlate this quality with land use. Of major importance in this assessment is the determination of the impact of hazardous waste disposal in landfills on ground-water quality. Hydrologic studies are needed to assess water quality and the various land uses for the gulf coastal plain without doing a detailed study of the entire area.

OBJECTIVE: The objective of this study is to develop a relationship between land use and water quality at two study areas in which the surficial deposits are representative of those in the gulf coastal plain. The study will focus on potential and existing contamination of shallow ground water by organic compounds and trace elements. Appropriate equivalent methods will be used for data collection and interpretation in the two study areas to ensure that results will be comparable.

APPROACH: Each proposed study area includes about 120 square miles and has similar hydrologic characteristics. Initially, land use within each study area will be documented, and data on the hydrogeology and water quality will be compiled. Additional wells will be scheduled and all wells will be sampled. Based on these data, hypotheses of the relationship between land use and ground-water quality will be developed, and a program for additional data collection will be formulated.

PROGRESS: Augered four wells in the shallow Pleistocene. Two wells were in the industrial area and two were in the agricultural area. These wells plus one other were sampled for chemical analyses. A water level map has been completed for the "400- and 600-foot" sands at Baton Rouge, Louisiana. Flow direction and rate have been determined. Selected parts of the report have been written. Additional sites have been selected for augering and sampling in the shallow Pleistocene.

PLANS FOR FY-85: Auger and sample 10 wells in the shallow Pleistocene. Complete water-level map of shallow Pleistocene. Better define land use. Complete report.

PROJECT TITLE: Hydrologic investigations in the lower Calcasieu River basin

PROJECT NUMBER: LA84-087

STUDY LOCATION: Calcasieu and Cameron Parishes, Louisiana

COOPERATING AGENCY: Department of Environmental Quality, Office of Water Resources

PROJECT CHIEF: Max J. Forbes, District Office, Baton Rouge

PROJECT DURATION: April 1984 through September 1985

PROBLEM: The lower Calcasieu River, from the vicinity of Lake Charles to the Gulf of Mexico, is a complex waterway system of river channels, connected lakes, and a dredged ship channel. The Lake Charles area is one of the major ports and industrial centers of Louisiana. Industry is predominately petro-chemical in nature and demands for water for processing and waste dilution are high. Especially troublesome for waste assimilation are the low-flow periods of the Calcasieu River, but contamination of the river and adjacent waterways is an ever-present possiblity.

OBJECTIVE: Determine streamflow on a daily or more frequent basis at the saltwater barrier north of Lake Charles as a continuing network activity. Define water movement during an intensive hydrologic survey of the lower Calcasieu River system in June 1984, in conjunction with other organizations. Define the physical characteristics of the river system, the movement of water within the system with specific emphasis on seasonal variations, and the factors affecting water movement (tide, wind, downstream flow).

APPROACH: Define the physical characteristics and the movement of water in the river system, with an emphasis on seasonal variation. Participate in an intensive hydrologic survey of the system to document stage, discharge, and velocity at selected sites. Investigate feasibility of using a hydrologic model to simulate water movement in the lower part of the system.

PROGRESS: Stage gages were installed at the saltwater barrier near Lake Charles and at Burton's Landing. Numerous cross sections have been completed with a fathometer to define the river system physical characteristics. A wind gage was installed at Burton's Landing. The planned intensive survey was completed and results made available to the cooperator. Several high-water measurements were made at Burton's Landing and the railroad bridge in Lake Charles.

PLANS FOR FY-85: Additional physical characteristics of the system will be determined, particularly in Lake Charles and Prien Lake, where extensive dredging has occured. A dye-tracer study will be conducted at Burton's Landing to determine flow patterns in the waterways downstream. Discharge determinations will be made using the stage-gage data, other data, and the Branch model. Data will be furnished to the cooperator and an investigative report prepared. Another intensive survey will be conducted after coordinating a location and time with the cooperator.

PROJECT TITLE: Determination of flood characteristics for coastal streams in Louisiana, (Research merit project)

PROJECT NUMBER: LA85-088

STUDY LOCATION: Coastal Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Highways

PROJECT CHIEF: J. Josh Gilbert, District Office, Baton Rouge

PROJECT DURATION: October 1984 through September 1989

PROBLEM: A technique to determine flood characteristics of flat-sloped coastal streams is needed for design of highway bridges and culverts in Louisiana.

OBJECTIVE: (1) Collect, analyze, and interpret continuous-discharge data and basin-characteristics information for approximately 12 stations on coastal streams in Louisiana. (2) Define a suitable procedure for extending flood record. (3) Develop a regionalized method for describing flood characteristics of flat-sloped or coastal streams in Louisiana.

APPROACH: Data and procedures are being analyzed to determine the best approach to defining flood characteristics in flat-sloped areas. In the flat-sloped areas that are tidally affected, accurate discharges and flow volumes must be determined from information gathered at sites which are equipped with magnetic flow meters, continuously monitored.

PROGRESS: New Project.

PLANS FOR FY-85: Flow data and watershed characteristics will be collected and analyzed for one or two representative watersheds.

PROJECT TITLE: A comparison of methods for determining flood characteristics of urban stormwater runoff in the Baton Rouge metropolitan area, Louisiana

PROJECT NUMBER: LA85-088A

STUDY LOCATION: Baton Rouge, Louisiana

COOPERATING AGENCY: U.S. Geological Survey Urban Program

PROJECT CHIEF: Richard A. Herbert, District Office, Baton Rouge

PROJECT DURATION: October 1983 through September 1985

PROBLEM: There is very little information on flood runoff for urban watersheds in southeastern Louisiana. Understanding and quantifying the impacts of urbanization is essential for effective flood-plain management and for efficient design of structures. Several methods of predicting flood-frequency relationships in urban areas are available but have not been tested or verified in southeastern Louisiana. Historically, flood-frequency relationships have been developed in urban areas only after extensive and expensive data collection. Due to a continuing need to provide flood-frequency information, a reliable, economic method to determine the effects of urbanization on flooding needs to be developed.

OBJECTIVE: Determine the impacts of urban development on the magnitude and frequency of floods in Baton Rouge, Louisiana. Compare the results obtained using several increasingly complex methods of determining the magnitude and frequency of floods.

APPROACH: Several watersheds in the Baton Rouge metropolitan area will be instrumented with a continuous-recording stream gage and two to three continuous-recording rain gages. Basin characteristics will be determined for each watershed. Several models and existing regression equations will be compared for several storms on each watershed.

PROGRESS: This project has been minimally funded by the National Urban Program for 2 years. Three stream gages and six rain gages have been installed and maintained.

PLANS FOR FY-85: If funding is available, analysis of urban stormwater runoff will be started.

PROJECT TITLE: Analysis of embankment modifications on backwater at the U.S. Highway 90 crossing of the Pearl River, near Slidell, Louisiana

PROJECT NUMBER: LA84-089

STUDY LOCATION: Southeastern Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Highways

PROJECT CHIEF: J. Josh Gilbert, District Office, Baton Rouge

PROJECT DURATION: October 1984 through September 1985

PROBLEM: High water in recent years has caused damaging flooding in the Pearl River basin, particularly in the Slidell area. Highway embankments crossing the flood plain near Slidell constrict and redistribute flood flows, increasing water-surface elevations upstream of the embankments.

OBJECTIVE: To simulate changes in hydraulic characteristics from proposed modifications of highway crossings. The modifications to be investigated are designed to improve the efficiency of the highway crossings, reducing backwater throughout the study area.

APPROACH: Use a two-dimensional finite-element surface-water model, developed in the analysis and definition of the backwater at U.S. Highway 90, as a basis for simulating the effect of modification of highway embankments. The process involves modification and addition to the existing model network, using boundary conditions based on the 1983 flood data.

PROGRESS: Modifications to the model network have been made for three of the four embankment modifications to be simulated. Initial simulations have begun and usable results are expected in April 1985.

PLANS FOR FY-85: Prepare report.

PROJECT TITLE: Minor elements in ground water

PROJECT NUMBER: LA85-090

STUDY LOCATION: Louisiana, statewide

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Don C. Dial, District Office, Baton Rouge

PROJECT DURATION: October 1984 through September 1987

PROBLEM: Concern over the occurrence of barium, lead, and other minor elements in ground water in Louisiana. Quantitative information on the concentration of minor elements is needed to determine background levels. These data will be compared to areas where abnormal concentrations of minor elements occur. The source and extent of minor elements in ground water in areas with high concentrations will be studied.

OBJECTIVE: (1) Determine the concentration of minor elements in ground water in the major aquifers within the State. (2) Define the mineral and chemical composition of the aquifers in relation to minor element concentrations observed in ground water. (3) Determine the significance of man-made activities that might introduce minor elements into ground water.

APPROACH: Sample ground water from each of the major aquifers to determine background concentrations of minor elements. Sample ground water in areas suspected of high minor-element concentrations. Drill and core in an area where high minor-element concentrations are observed and in a nearby control area. Analyze the mineralogy and minor-element concentrations of the core material. Evaluate the source of the high minor-element concentrations based on geochemical controls and laboratory analyses.

PROGRESS: New project.

PLANS FOR FY-85: Review literature on minor elements. Consult with various State, Federal, and university persons knowledgeable in the subject to identify minor-element hot spots. Sample 15 to 20 wells for minor-element concentrations.

PROJECT TITLE: Geohydrologic characteristics of the Sparta aquifer, north-central Louisiana

PROJECT NUMBER: LA85-091

STUDY LOCATION: Northern Louisiana

COOPERATING AGENCY: Department of Transportation and Development, Office of Public Works

PROJECT CHIEF: Harry McWreath, District Office, Baton Rouge

PROJECT DURATION: October 1984 through September 1987

PROBLEM: Extensive and intensive pumping of the Sparta aquifer, the most important aquifer in northern Louisiana and southern Arkansas, has caused development of numerous cones of depression and a regional lowering of the water levels. The principal concern for the Sparta aquifer is the effects of increased development on water levels, particularly as a result of large localized increases in pumpage. A secondary concern is the potential for pollution of the aquifer by landfills in the recharge areas and the possible use of salt domes as repositories for nuclear wastes and liquified petroleum gas.

OBJECTIVE: Develop a technique to evaluate the regional effects on the Sparta aquifer resulting from increased development. Specifically, (1) evaluate the geohydrologic characteristics of the Sparta aquifer, particularly the recharge, discharge, and leakage characteristics. (2) Assess the effects of pumping stresses on water levels and define areas where the water levels are below the top of the Sparta aquifer under existing and projected conditions.

APPROACH: Establish a well-network data base for each of the geohydrologic units of interest. Collect water-level data and prepare potentiometric maps of the principal geohydrologic units. Evaluate geohydrologic characteristics of the aquifers by flow-net and water-budget methods. Develop three-dimensional model of the aquifer system. Conduct model simulations under various pumping stresses.

PROGRESS: New project.

PLANS FOR FY-85: Compile data and begin preliminary model development.

APPENDIX A

Publications of the Louisiana District of the U.S. Geological Survey

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

For the reports listed below, address inquires about the Water-Resources Bulletins and the Water-Resources Pamphlets to the Louisiana Department of Transportation and Development, Office of Public Works, P.O. Box 94245, Baton Rouge, Louisiana 70804-9245; the Louisiana Geological Survey, P.O. Box G, Baton Rouge, Louisiana 70893; or the District Chief, Water Resources Division, U.S. Geological Survey, P.O. Box 66492, Baton Rouge, Louisiana 70896. Address inquires about the Basic-Records Reports, Technical Reports, unnumbered reports, and the Water-Resources Special Report to the Louisiana Department of Transportation and Development (address shown above).

Water-Resources Bulletins

1. Ground water in Louisiana, by J. R. Rollo. 1960.

2. Ground-water conditions in the Baton Rouge area, 1954-59 with special reference to increased pumpage, by C. O. Morgan. 1961.

3. Water resources of Sabine Parish, Louisiana, by L. V. Page, Roy Newcome, Jr., and G. D. Graeff, Jr. 1963.

4. Water resources of Natchitoches Parish, Louisiana, by Roy Newcome, Jr., L. V. Page, and Raymond Sloss. 1963.

5. Water resources of Bossier and Caddo Parishes, Louisiana, by L. V. Page and H. G. May. 1964.

6. Water resources of Vernon Parish, Louisiana, by J. E. Rogers and A. J. Calandro. 1965.

7. Ground water in the Geismar-Gonzales area, Ascension Parish, Louisiana, by R. A. Long. 1965.

8. Water resources of Rapides Parish, Louisiana, by Roy Newcome, Jr. and Raymond Sloss. 1966.

9. Ground-water resources of the Greater New Orleans area, Louisiana, by J. R. Rollo. 1966.

10. Effects of ground-water withdrawals on water levels and salt water encroachment in southwestern Louisiana, by A. H. Harder, Chabot Kilburn, H. M. Whitman, and S. M. Rogers. 1967.

11. Water resources of Pointe Coupee Parish, Louisiana, by M. D. Winner, Jr., M. J. Forbes, Jr., and W. L. Broussard. 1968.

12. Water resources of the Lake Pontchartrain area, Louisiana, by G. T. Cardwell, M. J. Forbes, Jr., and M. W. Gaydos. 1967.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY--Continued

Water-Resources Bulletins--Continued

13. Salt-water encroachment in aquifers of the Baton Rouge area, Louisiana, by J. R. Rollo. 1969.

14. Water resources of Ouachita Parish, Louisiana, by J. E. Rogers, A. J. Calandro and M. W. Gaydos. 1972.

15. Ground-water resources of Avoyelles Parish, Louisiana, by J. R. Marie. 1971.

16. Ground water in the Plaquemine-White Castle area, Iberville Parish, Louisiana, by C. D. Whiteman, Jr. 1972.

17. Water resources of Union Parish, Louisiana, by J. L. Snider, A. J. Calandro, and W. J. Shampine. 1972.

18. Ground-water resources of the Norco area, Louisiana, by R. L. Hosman. 1972.

19. Ground-water resources of Morehouse Parish, Louisiana, by T. H. Sanford, Jr. 1973.

20. Geohydrology of the Evangeline and Jasper aquifers of southwestern Louisiana, by M. S. Whitfield, Jr. 1975.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

Unnumbered Water-Resources Pamphlets

--- The geology and ground water resources of Calcasieu Parish, by A. H. Harder. 1960.

--- Pumpage of water in Louisiana, 1960, by J. L. Snider and M. J. Forbes, Jr. 1961.

--- Sources of emergency water supply in the Alexandria area, Louisiana, by R. Newcome, Jr. 1961.

--- Emergency ground-water supplies in Calcasieu Parish, Louisiana, by G. W. Swindel and A. L. Hodges, Jr. (year not given)

--- Emergency ground-water supplies in the Monroe Area, Louisiana, John L. Snider. 1962.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY--Continued

Numbered Water-Resources Pamphlets

1. An analysis of contour maps of water levels in wells in southwestern Louisiana, 1952 and 1953, by S. W. Fader. 1954.

2. An analysis of contour maps of water levels in wells in southwestern Louisiana, 1954, by S. W. Fader. 1955.

3. Geology and ground-water resources of the Alexandria area, Rapides Parish, Louisiana, by M. L. Klug. 1955.

4. An analysis of contour maps of 1955 water levels, with a discussion of salt-water problems in southwestern Louisiana, by S. W. Fader. 1957.

5. Water levels and water-level contour maps for southwestern Louisiana, 1956 and spring 1957, by S. W. Fader. 1958.

6. Summary of ground-water conditions in southwestern Louisiana, 1957 and 1958, with a discussion of Iron in water from the Chicot aquifer, by A. N. Turcan, Jr., and S. W. Fader. 1959.

7. Ground-water resources of the Red River Valley alluvium in Louisiana, by Roy Newcome, Jr. 1960.

8. Water levels and water-level contour maps for southwestern Louisiana, 1958 and 1959, by A. H. Harder. 1960.

9. Interim report on ground-water conditions between Baton Rouge and New Orleans, Louisiana, by G. T. Cardwell and J. R. Rollo. 1960.

10. Water levels and water-level contour maps for southwestern Louisiana, 1959 and spring 1960, with a discussion of Ground-water withdrawals, by A. H. Harder. 1961.

11. Water levels in southwestern Louisiana, April 1969 to April 1961, with a discussion of, Water-level trends from 1950 to 1960, by Chabot Kilburn and H. M. Whitman. 1962.

12. Ground-water conditions in southwestern Louisiana, 1961 and 1962, with a discussion of The Chicot aquifer in the coastal area, by H. M. Whitman and Chabot Kilburn. 1963.

13. Gas and Brackish water in fresh-water aquifers, Lake Charles area, Louisiana, by A. L. Hodges, Jr., S. M. Rogers, and A. H. Harder. 1963.

14. Methane in the Fresh-water aquifers of southwestern Louisiana and theoretical explosion hazards, by A. H. Harder, H. M. Whitman, and S. M. Rogers. 1965.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY--Continued

Numbered Water-Resources Pamphlets--Continued

15. Feasibility of a scavenger-well system as a solution to the problem of vertical salt-water encroachment, by Richard A. Long. 1965.

16. Estimating water quality from electrical logs in southwestern Louisiana, by Harry M. Whitman. 1965.

17. Salt-water encroachment Baton Rouge area, Louisiana, by R. R. Meyer and J. R. Rollo. 1965.

18. Progress report on the availability of fresh water, Lake Pontchartrain area, Louisiana, by G. T. Cardwell, M. J. Forbes, Jr., and M. W. Gaydos. 1966.

19. Calculation of water quality from electrical logs, theory and practice, by A. N. Turcan, Jr. 1966.

20. Pumpage of water in Louisiana, by P. P. Bieber and M. J. Forbes, Jr. 1966.

21. Water resources of the Lettsworth-Innis-Batchelor area, Pointe Coupee Parish, by A. H. Harder, V. B. Sauer, and W. L. Broussard. 1968.

22. Water-level trends in southeastern Louisiana, by D. C. Dial. 1968.

23. Water resources of northwestern St. Landry Parish and vicinity, Louisiana, by R. L. Hosman, W. L. Broussard, and A. J. Calandro. 1970.

24. Water resources of the Slagle-Simpson-Flatwoods area, Louisiana, by C. D. Whitman, Jr., A. J. Calandro, and W. L. Broussard. 1970.

25. Water resources of the Belmont-Marthaville-Robeline area, Louisiana, by A. J. Calandro, W. L. Broussard, and R. L. Hosman. 1970.

26. Pumpage of water in Louisiana, 1970, by D. C. Dial. 1970.

27. Ground-water pumpage and related effects, southwestern Louisiana, 1970 with a section on surface-water withdrawals, by Allan L. Zack. 1971.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY--Continued

Basic-Records Reports

1. Statistical summaries of stream-gaging station records, Louisiana, 1938-64, by M. F. Cook. 1968.

2. Chemical quality of surface waters of Louisiana, 1959-63, by A. C. Duncan. 1967.

3. Public water supplies in Louisiana, by D. C. Dial. 1970.

4. Gazetteer of Louisiana lakes and reservoirs, by W. J. Shampine. 1970.

5. Chemical, biological, and physical data for the major lakes and reservoirs in Louisiana, by W. J. Shampine. 1971.

6. Drainage area of Louisiana streams, by Raymond Sloss. 1971.

7. Ground-water levels in Louisiana for wells measured through 1974, by U.S. Geological Survey. 1975.

8. Index to water-resources data for Louisiana--Part 1, Surface-water records; Part 2, Water-quality records, by U.S. Geological Survey. 1975.

9. Index to water-resources data for Louisiana, ground-water records, by S. L. Marshall. 1978.

10. Index to water-resources data for Louisiana, surface-water records, water-quality records, by O. L. Benton and P. C. Higgins. 1981.

11. Ground-water data for the Mississippi River parishes in the Greater New Orleans area, Louisiana, by D. C. Dial. 1983.

12. Records of water-level measurements and lithologic logs, Red River Valley, Louisiana, 1975-80, by C. W. Smoot. 1983.

LOUISIANA STATE PUBLICATIONS PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY--Continued

Water Resources Technical Reports

1. Water-supply characteristics of Louisiana streams, by L. V. Page. 1963.

2a. Rainfall-runoff relations for southeastern Louisiana and southwestern Mississippi, by A. J. Calandro. 1967.

2b. Unit hydrographs for southeastern Louisiana and southwestern Mississippi, by V. B. Sauer. 1967.

2c. Rainfall-runoff relations for southwestern Louisiana, by F. N. Lee. 1969.

2d. Unit hydrographs for southwestern Louisiana, by V. B. Sauer. 1969.

3. Rainfall-runoff-hydrograph relations for northern Louisiana, by V. B. Sauer. 1970.

4. Evaporation study at Sharp Station pond near Baton Rouge, Louisiana, by F. N. Lee. 1969.

5. Hydrologic and quality characteristics of the lower Mississippi River, by D. E. Everett. 1971.

6. An analysis of stream temperatures in Louisiana, by A. J. Calandro. 1973.

7. Water quality and waste assimilative capacity of the Pearl River below Bogalusa, Louisiana, by D. E. Everett, L. D. Fayard and F. C. Wells. 1973.

8. Water resources of the Ruston area, Louisiana, by T. H. Sanford, Jr. 1973.

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APPENDIX B

Sources of Water-Resources Information in the U.S. Geological Survey

SOURCES OF WATER RESOURCES INFORMATION IN THE U.S. GEOLOGICAL SURVEY

Hydrologic Information Unit

Questions about water resources in general or about the water resources of specific areas of the United States can be directed to the Hydrologic Information Unit. This office will also answer inquiries about the availability of reports of water-resources investigations.

Hydrologic Information Unit
U.S. Geological Survey
420 National Center
Reston, Virginia 22092

Louisiana Water Resources

Questions specific to water resources in Louisiana can be directed to the Louisiana District Office. This office will answer inquiries about reports and other Louisiana water-resources publications.

District Chief
U.S. Geological Survey
Water Resources Division
P. O. Box 66492
Baton Rouge, Louisiana 70896

Office of Water Data Coordination

The OWDC (Office of Water Data Coordination) is the focal point for interagency coordination of ongoing and planned water-data acquisition activities of all Federal agencies and many non-Federal organizations. The "National Handbook of Recommended Methods for Water-Data Acquisition," indexes to the "Catalog of Information on Water Data," and other publications are available from OWDC. For further information, write:

Office of Water Data Coordination
U.S. Geological Survey
417 National Center
Reston, Virginia 22092

National Water Data Exchange

NAWDEX (National Water Data Exchange) maintains a computerized data system that identifies sources of water data and indexes information on the water data available from the sources. The NAWDEX Program Office and local Assistance Centers assist data users in locating sources of water data, identifying sites at which data have been collected, and obtaining specific data. For further information, write:

National Water Data Exchange
U.S. Geological Survey
421 National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

Public Inquiries Offices

USGS Public Inquiries Offices in the following cities provide general information about the Geological Survey's programs and its publications; and they sell, over the counter, maps of local and general interest:

USGS Public Inquiries Office
1100 Commerce Street
Room 1-C-45 Federal Building
Dallas, Texas 75242
Phone: (214) 767-0198

USGS Public Inquiries Office
1961 Stout Street
169 Federal Building
Denver, Colorado 80294
Phone: (303) 837-6167

+USGS Public Inquiries Office
12201 Sunrise Valley Drive
Room 1-C-402, 503 National Center
Reston, Virginia 22092
Phone: (703) 860-6167

+USGS Public Inquiries Office
19th and F Streets, NW
Room 1028 General Services Building
Washington, DC 20244
Phone: (202) 343-8073

+The Reston and Washington PIO's sell maps of all the States and most USGS Books.

APPENDIX C

Sources of U.S. Geological Survey Publications

SOURCES OF U.S. GEOLOGICAL SURVEY PUBLICATIONS

Books, Maps, and Periodicals

Since 1879, the U.S. Geological Survey has served the public and Federal, State, and local governments by collecting analyzing, and publishing detailed information about the Nation's mineral, land, and water resources. This information is in a variety of map, book, and other formats and is available from several sources within the Geological Survey.

Books, Catalogs, and Pamphlets

To order USGS book publications, catalogs*, and pamphlets, write:

Test Products Section, Eastern Distribution Branch,
U.S. Geological Survey,
604 South Picket Street, Alexandria, Virginia 22304

Maps

To order maps of areas east of the Mississippi River (including Minnesota, Puerto Rico, and the Virgin Islands), write:

Eastern Distribution Branch, U.S. Geological Survey,
1200 South Eads Street, Arlington, Virginia 22002

To order maps of areas west of the Mississippi River (including Alaska, Hawaii, Louisiana, Guam, and Samoa), write:

Western Distribution Branch, U.S. Geological Survey,
Box 25286, Federal Center, Denver, Colorado 80225

New Publications

To get on the mailing list for the free monthly catalog, "New Publications of the Geological Survey," write:

Mailing List Unit, U.S. Geological Survey,
329 National Center, Reston, Virginia 22092

Open-File Reports

For information on the availability of microfiche or paper duplicate copies of selected open-file reports, write:

Open-File Services Section, U.S. Geological Survey,
Box 25425, Federal Center, Denver, Colorado 80225

*Two cumulative catalogs (1879-1961 and 1962-1970) sell for $2.00 each. The annual catalogs for 1971 and subsequent years are free. See "New Publications of the Geological Survey" above for information about the monthly catalogs.